

Necrotizing Enterocolitis: The Current Knowledge and What Remains

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Received: February 25, 2019; **Published:** March 21, 2019

Abstract

Necrotizing enterocolitis (NEC) is one of the most important conditions to affect preterm babies in our clinical setting today. It presents with many features that are critical in its recognition, many obstacles in its management, and many unanswered questions for the future in terms of prevalence and how to control existing risk factors, if any. The theory of the gut microbiome is an essential factor in the understanding of NEC and charting of its course with different lines of management. In this paper, we discuss the already established knowledge of necrotizing enterocolitis and what remains for future practice.

Keywords: *Necrotizing Enterocolitis (NEC); Preterm Babies; Pneumoperitoneum*

Clinical setting

In our modern practice today, a child born with NEC will be found to have a low APGAR score and a toxic-looking appearance [1]. Our indications of ordering an abdominal x-ray are to assess the apparent abdominal distension and to rule out any other intestinal conditions such as duodenal atresia, and meconium plugs.

The quickest sign that will help to recognize this condition is the intolerance of a preterm infant to its first feed, later progressing to a visibly distended, and at times erythematous abdomen [1].

An abdominal ultrasound helps to detect the gases within the intramural layer as a result of the inflammation, and has been found to be more fundamental in certain cases, such as pneumoperitoneum, and is sensitive for fluid collection and/or perforation [1,2].

It is important in preterm newborns presenting with NEC to ensure an intact circulation exists within their system, as these babies could present with hematochezia which reflects the volume of bleeding lost with each passage of stool even if minimal, as well as thrombocytopenia which indicates the overconsumption of platelets during the course of the inflammation, and the worst case scenario of ischemia as a result of said inflammation.

The usual line of management early on will start with direct access to IV fluids and broad-spectrum antibiotics after stopping all forms of existing feeds [1]. This is all under the observation of a pediatrician, but a pediatric surgeon will be the one to call for conditions complicated by perforation and pneumoperitoneum.

The gut microbiota

The main idea behind the pathophysiology of NEC is the disruption of the pre-existing bacterial colonization that serves as a protective mechanism for the immature intestine from opportunistic infections by bacterial agents that tend to overgrow and cause inflammation within the intestinal lining.

Some bacterial organisms that have come to be known in cases of necrotizing enterocolitis include the Clostridia family (*Clostridium perfringens*, *Clostridium neonatale*, etc.) with their toxins [3], *Klebsiella pneumoniae* and subtypes of *E. coli* (uropathogenic form).

The protective mechanism is known as 'gut symbiosis' emphasizing on the neutral relationship between host and pathogen, whilst the defect of said mechanism is known as 'gut dysbiosis' [3].

Complications

The development of pneumoperitoneum serves as the ultimate hazard of NEC highlighting the extent of the inflammation and being recognized famously on x-ray as 'pneumatosis intestinalis' with gas cysts within the lining of the intestinal wall as opposed to the lumen [1].

The diffuse intestinal necrosis serves as a precursor to the formation of sepsis which is undoubtedly fatal [4] and the management will be converted from conservative (the components of which are mentioned above) to the surgical approach of laparotomy wherein the necrotic portion of the bowel will be resected and the remaining adjacent lengths will be preserved [5].

Further studies are currently attempting to understand the relationship between NEC and how it can develop into other long-term complications including strictures, stomas, short bowel syndrome and neurodevelopmental problems [5].

Treatment modalities

After ensuring that the condition of the child is under control, there are promising forms of feeding that are able to help provide a good prognosis such as a combination of probiotics and breast milk, whereby the commensal flora is adequately modulated for its protective effects, and the newborn receives its necessary immunological and nutritious factors from its mother.

As far as preventive methods go, some standardized regimens of maternal breastmilk would be advisable to help infants at risk of developing NEC early on as suggested by de la Cruz and Bazacliu [6]. We cannot however deny that a particular formula will be essential in the long run of managing NEC and will help us ensure that the gut is well-adapted to healing rather than being under the hazardous control of the bacterial overgrowth leading to further dysfunction [7].

Discussion

According to Elgin, *et al.* (2016) and Schmidt, *et al.* (2011), the exposure to antibiotic therapy in a hospital environment can in fact trigger the process of 'gut dysbiosis' and not allow the intestinal commensal mechanism to take its course as required [8,9].

Bacteriotherapy has been suggested as an approach to help manage NEC by correcting the 'gut dysbiosis' at hand as Hosny, *et al.* concluded in their update on the gut microbiota and its relevance to necrotizing enterocolitis, but that can also be discussed with the promising preventive methods by probiotics in infants of low birth weight, as evidenced by M. Lau and Chamberlain in their 2015 meta-analysis, revealing a 49.1% risk reduction in 20 randomized controlled trials [3,10].

Conclusion

In conclusion, necrotizing enterocolitis serves as the most common GI emergency in preterm babies, and can be clinically characterized by a lack of tolerance to the first feed provided along with abdominal distension and progressive thrombocytopenia [1]. The management today includes cessation of current feeds, access to IV fluids and antibiotics, and surgical intervention as indicated in cases of pneumoperitoneum or perforation. Future considerations of different formulas in the feeds, and properly established probiotics in intensive care should be determined to help overcome the prevalence of NEC.

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Volume 8 Issue 4 April 2019

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